

**Africa Research in Sustainable Intensification for the Next Generation (Africa RISING)**

**West Africa Project**

**MONITORING ADOPTION OF TECHNOLOGIES PROMOTED BY AFRICA RISING PROGRAM IN Mali**

**Technical report**

# Executive summary

Africa RISING is a 5-year research program with three regional projects including sustainable intensification of crop-livestock mixed farming systems in the Guinea/Sudan Savanna Zone of West Africa, Sustainable intensification of crop-livestock integrated farming systems in the Ethiopian highlands, and Sustainable intensification of cereal-legume-livestock integrated farming systems in East and Southern Africa. It was launched in 2011 and funded by the United States Agency for International Development (USAID). This program is focused on an innovative multi-stakeholder agricultural research with for main objective to identify and validate scalable options for the sustainable intensification of key African cereal-based farming systems to increase food production and improve the livelihoods of smallholder farmers and at the same time conserve or improve the natural resource base. Africa Rising in West Africa is being implemented in 25 intervention communities in the three northern regions of Ghana, and 10 villages in the Bougouni-Yanfolila and Koutiala Districts of the Sikasso Region in southern of Mali.

The objective of this report is to learn about adoption of improved agricultural practices promoted by the Africa RISING project in 9 intervention villages in Bougouni and Koutiala districts in Mali. The adoption analysis is based on the household survey which includes questions on topics such as your household characteristics and agricultural practices. The results showed that more than 50% of the participants to the project have tested contour bonding system in their field, and the half of the participants have conducted vegetable demonstrations. Concerning other improved technologies, less than half of the participants have conducted the experimentations including maize trail with fertilizer (40%), cowpea trial with bio-pesticide (31%), soybean trial (27%), intercropping sorghum-soybean (29%), and application of organic manure (49%). However, we noticed that about 74% of the participants to crop trials have applied at least one improved technologies in their field.

Regarding the benefits perceived from the Africa RISING technologies, the majority of the participants to the project activities emphasize that they perceived benefits from the application of the improved technologies. These technologies improve family nutrition (96%), increase agricultural production (94%), improve soil fertility (95%), improve insects control (84%), improve diseases control (86%), and increase income from agricultural production (90%).

However, there are some constraints to the application of the technologies at the farmer’s level. These constraints include the lack of specific knowledge about Africa Rising technologies (75%), uncertainty about financial gain generated by the technologies (64%), high risk related to technologies (57%), lack of land to apply technologies (54%), and shortage of money to buy for example improved seeds and mineral fertilizers (48%).

# Introduction

The West African Guinea/Sudan Savanna area is characterized by about 70 million small-scale, resource-poor farmers whose livelihoods depend on rain-fed crop, livestock, and crop-livestock farming systems. The weak integration of the crop and livestock enterprises as well as several interrelated technical, institutional and policy constraints in the region lead to a low productivity of the farming systems. Consequently, undernourishment, poverty, and environmental degradation are widespread. Most of projects implemented in this part of the world are focused largely on some aspects of the farming systems, such as few crop species and cropping systems, seed systems, soil fertility management, or few livestock species and husbandry systems, with little attention to the integrated management of the components of the farm, their interdependency and socio-economic impact on farm households and the natural resource base.

In response, Africa RISING project in West Africa developed a farming systems approach that aims at integrating the key components of the production systems (e.g., crop, soil/water and livestock) with household nutrition and capacity building can raise and sustain household food and nutrition security and income. Thus, the interactions among the main components of the crop, soil, and livestock components of the farming systems are considered to be the key research for development focus of the project. In Mali, the project is implemented in 10 villages in the Bougouni-Yanfolila and Koutiala Districts of the Sikasso Region and aims to provide pathways out of hunger and poverty for smallholder farm households through sustainably intensified farming systems. Thus, different trials of improved crop varieties and integrated soil fertility management practices to intensify production are carried out in these villages.

The objective of this report is to learn about early adoption of improved agricultural practices promoted by the Africa RISING project in 9 intervention villages in Bougouni and Koutiala districts. The adoption analysis is based on the household survey which includes questions on topics such as your household characteristics and agricultural practices. The rest of the report is organized as follow. Section 2 briefly describes the Africa RISING project. Section 3 provides sampling procedure and data analysis. Section 4 gives concluding remarks.

# Description of the Africa RISING project

Africa RISING is a 5-year research program with three regional projects including sustainable intensification of crop-livestock mixed farming systems in the Guinea/Sudan Savanna Zone of West Africa, Sustainable intensification of crop-livestock integrated farming systems in the Ethiopian highlands, and Sustainable intensification of cereal-legume-livestock integrated farming systems in East and Southern Africa. It was launched in 2011 and funded by the United States Agency for International Development (USAID). This program is focused on an innovative multi-stakeholder agricultural research with for main objective to identify and validate scalable options for the sustainable intensification of key African cereal-based farming systems to increase food production and improve the livelihoods of smallholder farmers and at the same time conserve or improve the natural resource base. Africa Rising in West Africa is being implemented in 25 intervention communities in the three northern regions of Ghana, and 10 villages in Bougouni and Koutiala Districts of the Sikasso Region in southern of Mali.

## Objectives of the Africa Rising in West Africa

Africa Rising in West Africa has for main objective to provide pathways out of hunger and poverty for smallholder farm households through sustainably intensified farming systems. The project will attempt to achieve this objective through increase adoption of sustainable intensification (SI) innovations that improve productivity, product quality, nutrition, income, and market access, and conserve the natural resources by smallholder farm households in the Guinea/Sudan savanna zone of West Africa. The widespread adoption of the SI innovations will require support from micro-finance and credit services and other institutional support services which are beyond the scope of this program. The project is based on the key hypotheses on adoption of improved crops including: i) a combination of improved crops (cereals, legumes, and vegetables), tree/shrub varieties, and agronomic practices will increase yields, income, and household food security more than the use of single technologies; and ii) participatory testing and evaluation of farming system innovations targeted to gender and farm types will increase farmers’ experimentation and adoption of technologies.

## Implementation Strategy and Project Approaches

The project is implemented in 10 intervention villages in southern Mali in Sikasso Region particularly in Bougouni and Koutiala districts (figure 1 below). The intervention communities were selected within larger recommendation domains with similar parameters, bio-physical (rainfall, length of growing period) and socioeconomic (market access), identified by IFPRI in collaboration with ICRISAT in Mali. The activities are implemented on-farm (80-90%) and on-station (10-15%) at the level of plot or field and are managed by researchers or farmers. On-farm activities are used to compare improved SI innovations with farmers’ practices, to demonstrate and scale-out new technologies and/or a combination of technologies, and to train research and development partners. The on-station trials are mostly implemented by graduate students to develop, test, and adapt new technologies as part of their dissertation research. For a wide adoption and scaling-out of SI innovations, a close collaboration is established with development projects in the area of intervention, particularly other USAID FtF projects which will include the research findings of Africa RISING in their programs. Where possible, the project activities will be linked with those of development projects to undertake joint activities, share information, and reach out to a larger number of poor farmers.

The participatory approaches are being used by multi-disciplinary and multi-institutional R4D teams to raise awareness on the project and to mobilize and characterize communities. District level R4D platforms are being established, consisting of a wide range of national and international research institutions, extension systems, farmers, CBOs, processors, service providers, input and output dealers, and policymakers. Regarding the gender mainstreaming, the project is based on two approaches. The first one is gender mainstreaming which includes the incorporation of relevant gender concerns into all the research objectives and activities, such as problem diagnosis, technology testing, improved food and nutrition security and income, market chain analysis, etc. The second approach is focused on strategic gender activities using multiple entry points to reduce drudgery and support emerging women farmers in adopting SI innovations. The gender mainstreaming and analysis component focuses on understanding the production constraints that women face and their preferences of SI innovations. A participatory market chain development approach to foster greater interaction and coordination among the various market actors is adopted. The objective is to create the awareness, capacity, and opportunities for farmers to become more powerful and informed actors in the market chain, able to negotiate and work with other actors rather than being passive price takers.

**Figure 1**: Africa RISING intervention villages in Mali



Source: Africa RISING project document, September 2014

# Sample design and data analysis

Adoption analysis of improved technologies promoted by the Africa RISING project uses household survey data. The survey was conducted in the 9 intervention villages in Bougouni and Koutiala districts, and involved participants and non-participants in the project in July 2016. The farmers have been chosen randomly. A total of 118 farmers producing mainly sorghum, millet, maize, and groundnut have been surveyed involving 92 participants and 26 non-participants. We interviewed the farmers who were available. Data were gathered on household socio-demographic, use of modern agricultural practices, and farmers’ perception about technologies.

**Table 1: Sample design by district in Mali**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Surveyed districts** | | |
| **Bougouni** | **Koutiala** | **Total** |
| Participants | 52 | 40 | 92 |
| Non-participants | 1 | 25 | 26 |
| Total | 53 | 65 | 118 |

Source: constructed using household survey data carried out in Mali, in July 2016.

## Socio-demographic profile of farmers surveyed

The results of survey show that among the farmers surveyed, the household size is estimated about 11 members in 2016. The majority of households is headed by a man who is relatively young, about 56 years old. The average age among the non-participants in the project is 60 years. About 20% of the household heads have received a formal education, generally the primary school level. Table 2 below depicts the results regarding the socio-demographic characteristics of the farmers surveyed.

Table 2: Socio-demographic profile of farmers surveyed

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Districts surveyed** | | |
| **Participants** | **Non-participants** | **Total** |
| Household size | 10.91 | 11.65 | 11.07 |
| Sex of household head | 96.74 | 100 | 97.46 |
| Age of respondent | 54.00 | 60.00 | 56.00 |
| Respondent educated | 20.66 | 19.23 | 20.34 |

Source: constructed using household survey data carried out in Mali, in July 2016.

## Utilization of improved technologies

Table 3 presents the results regarding the utilization of improved technologies in their field. The results show that among participants to the Africa RISING project, about 66% have applied intercropping, 44% have practiced crops rotation, and 88% have used at least one improved variety in their production system.

Table 3: Application of improved technologies

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Participants** | **Non-participants** | **Total** |
| Intercropping | 66.30 | 50.00 | 62.71 |
| Crops rotation | 44.57 | 46.15 | 44.92 |
| Use of improved seeds | 88.04 | 96.15 | 89.83 |

Source: constructed using household survey data carried out in Mali, in July 2016.

Table 4 depicts the participation of the farmers to the crop trials by technology promoted by the Africa RISING project in Southern Mali, particularly in Bougouni and Koutiala districts. More than 50% of the participants to the project have tested contour bonding system in their field, and the half of the participants have conducted vegetable demonstrations. Regarding the other improved technologies, less than half of the participants have conducted the experimentations including maize trail with fertilizer (40%), cowpea trial with bio-pesticide (31%), soybean trial (27%), intercropping sorghum-soybean (29%), and application of organic manure (49%). However, we notice that about 74% of the participants to crop trials have applied at least one improved technologies in their field.

Table 4: Participation to the crop trials promoted by the Africa RISING

|  |  |  |
| --- | --- | --- |
|  | **Participated in the crop trials** | |
| **Yes** | **No** |
| Contour bonding | 55.43 | 44.57 |
| Maize trial with fertilizer | 39.83 | 60.17 |
| Cowpea trial with biopesticide | 31.36 | 68.64 |
| Soybean trial | 27.12 | 72.88 |
| Intercropping sorghum-soybean | 29.66 | 70.34 |
| Vegetable demonstration | 50.00 | 50.00 |
| Use of organic manure | 49.15 | 50.85 |
| Intercropping vegetable-baobab | 39.83 | 60.17 |
| Applied at least one technology | 73.86 | 26.14 |

Source: constructed using household survey data carried out in Mali, in July 2016.

## Perceived benefits of the Africa RISING technologies

The results of the table 5 show that the majority of the participants to the project activities emphasize that they perceive the benefits from the application of the improved technologies : improve family nutrition (96%), increase agricultural production (94%), improve soil fertility (95%), improve insects control (84%), improve diseases control (86%), and increase income from agricultural production (90%).

Table 5: Perceived benefits of the Africa RISING technologies

|  |  |  |
| --- | --- | --- |
|  | **Participants to the project** | |
| **Yes** | **No** |
| AR technologies improve nutrition | 96.43 | 1.19 |
| AR technologies increase production | 94.04 | 1.19 |
| AR technologies improve soil fertility | 95.24 | 1.19 |
| AR technologies improve insects control | 84.52 | 5.95 |
| AR technologies improve diseases control | 86.91 | 7.14 |
| AR technologies increase farm income | 90.48 | 2.38 |

Source: constructed using household survey data carried out in Mali, in July 2016.

## Barriers to adopting the technologies

The results show that almost 75% of the participants to the project activities mention that the lack of specific knowledge about Africa Rising technologies is one barrier to adopting of the technologies promoted by the project in Bougouni and Koutiala districts. The other adoption constraints identified by the farmers’ participant in the Africa RISING project include uncertainty about financial gain generated by the technologies (64%), high risk related to technologies (57%), lack of land to apply technologies (54%), and shortage of money to buy for example improved seeds and mineral fertilizers (48%).

Table 6: Barriers to adopting of the Africa RISING technologies

|  |  |  |
| --- | --- | --- |
|  | **Participants in the project** | |
| **Yes** | **No** |
| Shortage of money | 48.19 | 42.16 |
| Lack of specific knowledge about AR technologies | 74.69 | 19.27 |
| AR technologies too risky | 56.63 | 32.53 |
| Uncertainty about gain generated | 63.86 | 22.89 |
| Lack of land to apply technologies | 54.21 | 38.55 |

Source : constructed using household survey data carried out in Mali, in July 2016.

# Conclusion

The objective of this report is to learn about early adoption of improved agricultural practices promoted by the Africa RISING project in 9 intervention villages in Bougouni and Koutiala districts in Mali. The early adoption analysis is based on the household survey which includes questions on topics such as your household characteristics and agricultural practices.

The results showed that more than 50% of the participants to the project have tested contour bonding system in their field, and the half of the participants have conducted vegetable demonstrations. Regarding the other improved technologies, less than half of the participants have conducted the experimentations including maize trail with fertilizer (40%), cowpea trial with bio-pesticide (31%), soybean trial (27%), intercropping sorghum-soybean (29%), and application of organic manure (49%). However, we noticed that about 74% of the participants to crop trials have applied at least one improved technologies in their field.

Regarding the benefits perceived from the Africa RISING technologies, the majority of the participants to the project activities emphasize that they perceived benefits from the application of the improved technologies. These technologies improve family nutrition (96%), increase agricultural production (94%), improve soil fertility (95%), improve insects control (84%), improve diseases control (86%), and increase income from agricultural production (90%).

However, there are some constraints to the application of the technologies at the farmers level. These constraints include the lack of specific knowledge about Africa Rising technologies (75%), uncertainty about financial gain generated by the technologies (64%), high risk related to technologies (57%), lack of land to apply technologies (54%), and shortage of money to buy for example improved seeds and mineral fertilizers (48%).

Efforts should be made in the framework of the second phase of the Africa RISING project in collaboration with the implementing partners to limit the adoption constraints identified below, but also for the inputs market development particularly improved seeds, organic manure, and mineral fertilizers in order to make